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***Re-shaping Learning Processes in Vocational Higher Education: a Study on Professional Competences in PBL Methodologies***

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**Abstract**

The main objective of the present work is to analyze and interpret the way changes promoted by PBL methodologies (either as *project-based learning* or *problem-based learning*) produce implications for the learning processes in vocational higher education.

Path analyses were carried out to evaluate possible changes to the graduates' profile. The first path analysis investigates if there is any kind of change at the level of how students access and produce knowledge. The second path analysis assesses to what extent PBL contributes to a more professionalized profile.

As the main contributions of this study, we highlight: there seems that the transference of previous knowledge to new situations enables integration and consolidation of learning, with a particular magnitude in the increment of competences; PBL methodologies seem to add more value essentially at the beginning of the graduates' professional career; and there are differences in perception of the type of competencies truly valued by employers.

**Keywords:** higher education, PBL, learning processes, professional competences

### ***Introduction***

A worldwide globalization and an increasing technological revolution are bringing out new professional and economic demands. These changes have challenged higher education institutions (HEIs) to adapt to new ways of production and dissemination of knowledge. Concretely, HEIs are being faced with having to modify their curricula and strategies in order to meet the needs of diverse professional contexts (Neumann, 2001). For all the discussion, often profound, that is taking place about higher education systems, some authors claim that conventional teaching methods are inadequate and that changing learning and teaching methodologies are needed (e.g. Savin-Baden & Major, 2004).

PBL methodologies are an example of these modern teaching methods. For the purposes of this article, the term PBL refers to the goals and processes of both *project-based learning* and *problem-based learning*. PBL is a way of organizing teaching by introducing professional problems to provide the context and motivation for the learning that follows. The most important innovative aspect of PBL is the shift from teaching to learning. In fact, PBL is concerned with both what students learn and how they learn it. As main aspects of this development, we highlight the change from a teaching to a learning paradigm, the promotion of simulated environments of relevant real situations, the active responsibility of students for their own knowledge, and the global and interdisciplinary character of this knowledge (Barrows, 1999).

The article is organized as follows. First, we will review the theoretical effect of PBL methodologies on learning processes. Second, after describing the research design, the empirical findings are reported. This is followed by a discussion and some conclusions.

### ***Paradigms of learning processes***

The idea of vocational higher education as enhancing new working values seems to justify a reflection on several paradigms of learning methodologies. *Learning to learn* has become part of the skills agenda. It involves learners in new ways of understanding reality, of interacting with others and of perceiving their own identities, motivating a conscious examination of the learning processes. Some authors argue that this will surely provide more solid grounds for *lifelong learning* than the mere acquisition of a skill set (e.g. Rawson, 2000).

Trying to identify not only the way knowledge is produced but also the type of knowledge that is produced, Gibbons and his colleagues (1994) presume that a new form of knowledge is emerging along side of a traditional one. The model proposed by these authors' is based in a two-order perspective: the traditional model of production of knowledge, *Mode 1*, and the new emergent model that induces knowledge, *Mode 2*. In particular, findings from Gibbons and his colleagues (1994) and, later, from Scott (2000) suggest that the two models can co-inhabit. Admitting that any model reduces reality, *Mode 1* and *Mode 2* are hypothesized in order to describe possible mutual influences between a traditional and an emergent way of producing knowledge. These set of problems induce some authors (e.g. Silén & Uhlin, 2008) to declare that conventional methods of instruction are inadequate for what needs to be known in professional education and so, there seems to be more and more agreement that higher education methodologies have to be rethought.

### ***PBL methodologies***

Among diverse strategies we highlight PBL methodologies, centred on the student-learning experience. PBL is a way of organising teaching by launching appropriate problems at the beginning of the instruction phase in order to provide the motivation and the context for the learning that follows. PBL methodologies appear as a support of real professional situations that students can integrate in the future. In the discussion about simulation's processes, it is fundamental to bring to the classroom real life situations. That means that instead of putting more reality into the learning, HEIs will need to put more learning into reality. In this perspective, the methodological frame of PBL analyzes the pertinence of an alliance between pedagogical and professional practices. So, we found that a structural change is essential when students meet PBL methodologies, since it challenges quite a few traditional ideas about learning objectives, processes and methods of evaluation.

Research conducted by more than a few authors (e.g. Hussain et al., 2007) indicates that such an educational strategy has proven valuable not only in enhancing problem-solving capability, but in the acquisition of various skills as the holistic approach and self-directed learning. These authors refer the capability of learning how to learn, the powerful motivation, the understanding of syllabus in context, or the

significant learning. Looking closely at PBL methodologies, it is understood that the core idea is founded on pragmatism, significant learning, and self and social competences.

This set of issues led us to formulate several research questions. In particular, we aim to know: (1) if there is any kind of change at the level of how students involved in PBL methodologies access and produce knowledge, and (2) to what extent PBL methodologies contribute to a more professionalized graduate profile.

Worth of note is the fact that most of the empirical studies reviewed use information gathered from students and / or academics' points of view. In comparison, this study combines not only those same perspectives but also the standpoints of other (very) interested parties: graduates and employers. The overall purpose is to identify patterns that describe the professional profile of a PBL learner. Consequently, this investigation has been informed by the reported practices and experiences among the collaboration between students, academics, employers, and graduates.

### ***The context of the study***

The research setting for our investigation was the course of *Projecto Profissional* (Professional Project) at the Higher Institute of Accounting and Administration of the University of Aveiro (ISCA-UA), as a PBL-type methodology. The generic objective of the course is the applied and contextual integration of previous information, in a global perspective, in order to prepare qualified professionals to be able to work in organisational environments. Strategically, Professional Project is placed at the end of the undergraduate accountancy programme. As a final synthesis, it is acquainted with a practical and interactive view of entrepreneurial contexts, increasing abilities, attitudes and competences previously identified with the graduate in accounting profile.

### ***Procedures for data and methods of analysis***

Our study employed both qualitative and quantitative research methods, with the data collection phase informed by the concept of a close-ended questionnaire to students and graduates, and a semi-structured

interview to employers and academics. To provide anonymity and increase reliability, not only none of the participants were named but also all were freely involved in the study and fully informed about it.

After a short examination we decided to include all the undergraduates involved in the course in the year the empirical part of the investigation runs (2004), and all the graduates since the beginning of the course (from 1997 to 2004). A total of 132 students and 423 graduates took part. The roll of students was provided by the coordination team and the names of graduates were obtained from the ISCA-UA's data base. Based on information gathered from teachers and ISCA-UA's human resources office, it was possible to generate a data base for all the academics involved in the course since its beginning, including their responsibilities as part of the coordination teams. After examination of data we decided to select only academics with four or more years' experience in Professional Project, ensuring that all the academics' coordination teams were included. A total of 14 academics covering the period from 1997 to 2004 were interviewed. In order to distinguish between a control group and a PBL group for a more clearly position, it is important to mention that PBL methodologies are not the leading approach at ISCA-UA. In fact, its curricular structure is a traditional one, with the exception of Professional Project. So, each student, academic or graduate has its own control group in the figure of non-PBL side experiences.

As to the enterprises, we looked for a representative sample of the different situations that occur. The lack of generalization that characterizes qualitative data leads us to hold a heterogeneous sample. In the first place, though we have chosen private and public employers, we focused on the formers as they are the mainly employers of ISCA-UA's graduates. Secondly, as we found a large variety of activities, it seemed important to include diverse situations. At last, and as a suggestion of an academic, we decided to add a self-employed graduate. A prospective approach was used to find out which enterprises systematically employed graduates from ISCA-UA to exercise in the accounting profession. In order to reduce the effect of just one side experience, the study design includes only those employers who enrolled employees with and without the PBL experience, so that each employer could have a double perspective. Besides, it was interesting and useful to understand that all the entities were well aware of the academic background of their employees. The prospective analysis reverted in a total of five employers, matching to 32 employees (23 with Professional Project).

In what concerns learning processes, several topics were considered. Explicitly, students and graduates were inquired if the teaching and learning methodology: (1) occurs in an environment close to the future professional one, (2) copies the unpredictability of the professional environment, (3) enables the resolution of new situations, (4) encourages self-learning, (5) incorporates previous subjects, (6) enables the resolution of concrete problems, (7) enables the understanding of the complexity of real facts, (8) enables an approach to reality, (9) connects theory and practice, and (10) makes use of the necessary techniques / practices to get these subjects fully operational. As to interviews, some categories were organized around learning processes. While the first five topics were also set to academics and employers, the last were replaced by (6) major number of competences, (7) answers to employers' expectations, and (8) gain advantage over other students.

Concerning professional competences students and graduates were asked about the importance of the teaching and learning methodology in: (1) the need for continuous learning, (2) the awareness of the (future) professional reality, (3) the use of relevant information for (future) professional life, (4) ethics internalization, (5) the establishment of a global vision, (6) professional success, (7) the resolution of professional problems, and (8) acquiring technical / theoretical knowledge. Once more, and due to the nature of the participants, while the first six topics were common to academics and employers the last ones were replaced by (7) lifelong learning.

Questionnaires were prepared for optical reading. Analysis of quantitative data was done using either SPSS (Statistical Package for Social Sciences) or SPAD (Système Portable d'Analyse des Donnés). Interviews were audio-taped and transcribed. Data was coded using QSR N6/NUD\*IST (Non-numerical Unstructured Data Indexing Searching and Theorizing) for qualitative data analysis.

### ***Results and discussion***

The results with respect to learning processes are, possibly, the ones which more closely confirm previous research findings. Nevertheless, and inspired on the information and opinions that we form after doing research, it seems possible to identify some issues worthy of note.

Among all the background variables explored, the possibility of transference of knowledge previously obtained to new situations enabling not only the integration and consolidation of learning but also promoting self-learning seems to be an important factor that systematically is reported. The assumptions of Scott (2000) about the role of real problems in the production of knowledge that hypothesize vocational higher education as a *know how to do* base, seems to legitimate our findings about the impact of PBL models in the learning processes.

In what concerns the interdisciplinary question, the empirical findings stress a multidisciplinary philosophy in order to promote a global vision. More important, however, is the inference that interdisciplinarity jointly with the possibility of transfer knowledge to new situations, appear to have a particular magnitude in a generalized increment of competences. In line with the literature, the findings of this study provide evidence of the importance of emergent methodologies like PBL in terms of *know how to do*.

The majority of previous studies used information gathered either from students or academics. This study, however, takes a different approach by combining not only those same perspectives but also the ones from graduates and employers. Although, theoretically, PBL's rationale states the methodology as a surplus value for employers, this study revealed that this fact is not always true.

Assuming that it is important for vocational HEIs to satisfy employers' expectations, a doubt still remains in the mind: how to apprehend the effective needs of organizations in order to find out what employers' demand? We suggest that refining ideas about prospective analysis, perhaps by creating detailed evaluative structures nearby enterprises and in closer proximity with the diverse entities that play in the entrepreneurial arena, would help to identify what kind of solicitations graduates have to answer. Possible feedback can, then, be included in the graduate's profile in agreement with the specific pattern.

But a broader question can be raised. Employers come out with the idea that even PBL graduates do not answer all their professional needs. Though we recognize to vocational HEIs the core mission of preparing to a professional activity, we argue that it is also an important issue of those same institutions to carry out a pedagogical role able to merge employers' needs into society's demands. This means that to face challenges HEIs cannot resume its role to a mere transmission of knowledge, but it has



to face a reorganization, which will allow more diverse and heterogeneous answers to a demanding, informed and competitive society.

The results also explore that simulation learning in vocational higher education help on a positive attitude that enables a softer changeover between the academic and the professional world. As a consequence, the advantages assigned to PBL methodologies appear to be particularly meaningful in the early stages of professional integration. Additionally, employers suggest that some of these advantages, mainly in terms of contextual application of professional concepts, tend to vanish as times goes by. Seeing that this aspect is not notionally isolated from the state of the art, it seems a particularly important finding revealed in this study. So, we argue that it is possible to link to the literature a conceptual variable about the temporal specification of PBL advantages, namely in the professional field. The understood idea is that PBL methodologies help on a more positive attitude, essentially, at the beginning of the graduate's professional career, enabling the entrepreneurial spirit of graduates.

### ***Conclusions***

This study argues that there are differences in perception of the type of competencies truly valued by employers. We suggest that maybe it is necessary to carry out some evaluative structures that enable the identification of what kind of situations graduates need to satisfy. If it is possible to recognize to vocational HEIs the mission to produce future graduates for a specialized professional activity, it is also important not to forget that those same institutions have also the charge to produce graduates that fit diverse professional options within a scientific area.

This study has recognized that PBL methodologies seem to add more value, essentially, at the beginning of the graduate's professional career. Some of the main contributions recurrently pointed out by all the study's participants refer to the methodological potential of PBL in promoting knowledge transferable to new situations, in encouraging self-learning, and in supporting interdisciplinarity. Additionally, employers suggest that some of these advantages, mainly in terms of contextual application of professional concepts, tend to vanish as times goes by.

In terms of methodology, it is argued that the approach presented in this article is wider than others employed in previous studies on professional competences and learning processes within PBL methodologies. The extent of the method lies in the incorporation of graduates and employers whereby, traditionally, only students and teachers are considered.

Even so, we are left wondering about the effective changes in emergent methodologies. If changes are to be effective, all the players need to be convinced about the purpose and benefits of such changes. But, most of all, more work is needed to justify pedagogical choices.

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